

EUROPEAN MEDICINE: A RESUME OF MEDICAL
PROGRESS DURING THE EIGHTEENTH AND
NINETEENTH CENTURIES.

(*Concluded.*)

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PHYSIOLOGICAL THEORY OF MEDICINE.



THE Physiological Theory of Medicine was originated by *Broussais* (1772-1838) and was a combination of the theories that had immediately preceded it. According to him life depended upon external irritation produced by heat, which excites new chemical processes, while these in turn stimulate regeneration, assimilation, as well as contractility and sensibility. When the functions supported by heat cease, death ensues. Health depends upon moderate action of external irritants; disease, upon either their weakness or their extraordinary strength. He saw nothing ontological about disease. In therapeutics he admitted the healing power of Nature. Febrile and inflammatory diseases were all treated by the withdrawal of nourishment, carried to the extreme. Bleeding was the main treatment—leeches and lancet.

SCHOOL OF PATHOLOGICAL ANATOMY AND DIAGNOSIS.

Contemporaneous with the School of Broussais and its antagonist—the Homeopathic System—was the Paris School of Pathological Anatomy and Diagnosis, which has given tone to the Medical Art. It made it the duty of the physician to search for changes in the human body, to investigate the local products of the disease, and assigned to medicine the duty of removing the products. The proper founders of this school were Corvisart, Dupuytren, and Laennec. One of its adherents was Bayle, who was the first to apply the ear to the thorax in diseases of the heart. Its most celebrated member was Cruveilhier, who revived the Anatomical Society, and wrote his famous treatise on Pathological Anatomy, illustrated with magnificent plates. Like Morgagni he associated general anatomy and pathological anatomy with bedside observations. To this system of medicine must be traced the practice of specialism in medicine and surgery so characteristic of the present day. The medical world has become

practically an enormous school of pathological anatomy and diagnosis—a school inaugurated by Bichat, as representing the so-called regular school of medicine.

ROKITANSKY'S NEW VIENNA SCHOOL.

An offshoot of the French School of Pathological Anatomy and Diagnosis was the so-called New Vienna School, the most eminent member of this system being von Rokitansky, who was a pathologist pure and simple, having performed more than thirty thousand autopsies during his life.

Karl Rokitansky (1804-1878) was born in Bohemia and studied medicine at Prague and Vienna. In 1844 he was appointed professor of pathological anatomy at the University of Prague, of which he became honorary director in 1848. He was made rector of the University of Vienna in 1850, and resigned his professorship in 1874. His chief book is "*Handbuch der Pathologischen Anatomie*," 1846. He is still considered one of the first authorities on pathology.

Rokitansky's friend and collaborer, *Skoda* (1803-1881), was the first medical man to lecture in German. His scientific merit was based upon the fact that he overthrew the specific and pathognomic arrangement of signs, as taught by the French, and substituted therefor a category, based upon the physical constitution and shape of organs and tissues. His endeavor was to develop a strictly scientific system of medicine out of the empirical French system or doctrine of physical signs, and in his work on *Physical Diagnosis* he displayed an independent spirit, though as one who received his impulse from the teachings of the French.

To Skoda must be laid the blame for the fact that practical medicine degenerated into simple diagnosis, and that by his observations on the natural course of disease, undisturbed by therapeutics, he became the founder and exponent of expectant and nihilistic therapeutics, the harbinger of a very cheerless period in the history of medicine of the German Empire. From this idea of diagnosis above everything, the Germans are but now rallying, and are paying more attention to the cure of disease than they did only ten years ago.

Oppolzer, Hebra, Jäger, Graefe, Fuchs, Mauthner, Hasner, Donders, Arlt, Stellwag, Politzer, and others are some of Skoda's distinguished contemporaries, to whose influence in

medicine more than any other list of men, is due the advanced condition of the various branches of the medical art, or the so-called specialties, and we will find it necessary to consider their names again later on in our history.

PHYSIOLOGICAL MEDICINE.

An offshoot of the New Vienna School is the so-called Physiological School founded by *Roser* (1817-1888), seconded by *Griesinger* and *Wunderlich*. Their claim was that Physiology must include vital phenomena, while from the morbid portions of these phenomena the special science should be formed as an artificial yet practical division of knowledge. *Wunderlich's* book on Therapeutics was for a long time the best guide in that direction, inasmuch as he left to individual thought and judgment—the Hippocratic method of investigation—the determination of value and demand. *Wunderlich* claimed that pathology was the physiology of the sick, whilst *Henle*, who started a school in opposition, under the name of *Rational Medicine*, made no distinction at all between the physiology of the well and the sick.

RADEMACHER'S SYSTEM.

Rademacher's system of medicine can be traced directly to the vagaries of *Paracelsus*, which had given rise to so many other schools, among the number being Homeopathy. The followers of the medical doctrine that bears the name of *Rademacher* classified the diseases of man by their therapy: they had but three universal remedies, namely, nitrate of sodium, copper, and iron, and therefore but three diseases—sodic nitrate, copper, and iron diseases.

HYDROPATHY.

Vincent Priessnitz, the founder of Hydropathy, was born at *Graefenberg*, in Austrian Silesia, 1799. *Priessnitz*, having his attention called to the virtues of cold water in the treatment of a bruise he had received from the kick of a horse, and being possessed of sharpness of intellect and aptitude for the practice of the healing art, though he had only a very common school education, began to give advice to his neighbors and friends how to cure all ailments with cold water, and soon attained con-

siderable reputation among them. Priessnitz left nothing in writing on his method of cure, but Wunde described his system under the title of "Die Priessnitsche Kurmethode."

The efficacy of water in the cure of numerous forms of disease has long been recognized, indeed as long as history can tell us. Water was largely employed by Hippocrates in the treatment of many diseases; and, along with the regular diet and an implicit belief in the *vis medicatrix naturæ*, it appears to have formed the chief element in his medical armory. Both Celsus and Galen speak favorably in their writings of the use of water in the cure of disease, regarding it as of high value in the treatment of acute complaints, particularly of fevers. Throughout the Middle Ages, likewise, many physicians, including Aetius and Paulus Aegineta, and the celebrated quack, Paracelsus, were advocates of the remedial virtues of water; all of them, however, having faith in its uses in the treatment of acute complaints, particularly of fevers, rather than in the possible cure of chronic cases.

In 1715 Niccolo Lanzoni, a Neapolitan physician, published a learned treatise on the subject of Hydropathy. In England, about the beginning of the eighteenth century, Floyer and Baynard made large use of water in the treatment of acute chronic diseases. Their conjoint work entitled "Psychrolousia; or the History of Cold Bathing both Ancient and Modern," is replete with quaint learning and practical shrewdness and sagacity. But the most able and scientific among the older treatises on the subject of the water treatment, is the work of the well-known Dr. Currie, published in 1797, and entitled "Medical Reports on the Effects of Water, Cold and Warm, etc." In this work Currie recommends the cold effusion in typhus and other fevers, and gives practical directions in regard to the cases and the times when it may be used with advantage. This practice was considered too dangerous by Currie's contemporaries and fell into speedy disuse or neglect, but at the present time these views, with but little change, are admitted by eminent physicians to be scientific in principle and practical in use.

Whilst Priessnitz had practically very little to do with the founding of Hydropathy, except as a form of quack treatment of various diseases, in which he was remarkably successful, Winternitz has made hydrotherapy popular and in a measure successful. Cold baths have become popular in the treatment of fevers,

such as typhoid fever, pneumonia, etc., and are used in the form of ice-pack, bath-tub immersion for a variable period of time, sponge-bath, shower-bath, sweat-bath, etc. Baths have their place and uses in the treatment of skin diseases and in the treatment of syphilis, rheumatism, etc., but are not used very much in private practice. Their proper place is in the therapy of the hospital and the sanitarium.

COMPARATIVE ANATOMY.

Georges Leopold Christian Frederick Dagobert Cuvier was born in the year 1769, at Montbeliard, a small town of Alsace. Cuvier gave early indications that nature had endowed him with her choicest intellectual gifts. After showing much zeal and energy in his youth and receiving the highest academical prizes, he turned his attention to Natural History, and was appointed professor of this branch of study at Paris in the year 1795. He soon gained a great reputation through his researches and discoveries in comparative anatomy, and his achievements in science have spread his fame over the civilized world.

Paul Joseph Barthez, born at Montpellier, 1734, founded a medical school at Montpellier, which gained a great reputation all over the civilized world. Barthez was considered one of the most learned physicians of France. His principal medical work was entitled "*Nouveaux Elémens de la Science de l'Homme*," which was published in 1778, and received great attention from the medical fraternity, on whose future welfare it had great influence.

Antoine Dubois (1756-1837) was a French surgeon of great skill and possessed a wide reputation as a practitioner and teacher of medicine. It was he who saved both the Empress Marie Louise and her child at the accouchement, when the Emperor Napoleon gave out his famous saying "*Give the mother the first chance.*" This principle has since been generally adopted by the medical profession.

Guillaume Dupuytren, born in France in the year 1777, located at Paris, and engaged in the practice of his profession. In 1801 he studied pathological anatomy with intense ardor. After a time Dupuytren became the chief surgeon of his day. Possessing extraordinary penetration in diagnosis, immovable firmness of nerve, and being bold and skilful in operating, nothing within the power of a surgeon was beyond his grasp, taking

into consideration the times in which he acted. Dupuytren was the inventor of many ingenious modes of operating, and of many surgical instruments, and he left the record of several important discoveries in pathological anatomy. He was the leader of an enlightened school of surgeons surpassed by none in his day and generation.

Sebalduſ Justinuſ Brugmanſ (1763-1819), a Dutch phyſician, improved the condition of the military hoſpitals, and by his efforts the 20,000 ſoldiers wounded at the battle of Waterloo were properly cared for. Many of his medical papers were published and were highly eſteemed by the medical men of the day.

Aleſſandro Volta, who was born in Italy, in 1745, made contributions to the ſcience of electricity which were of great importance; the chief of them being his theory that the electrical power or principle reſides in the metals. He alſo invented an electric battery, the electrophonous, the electrical condenser, the electrical piſtol, and the hydrogen lamp. After Volta Galvanism is often termed Voltaic electricity; and the practical unit of electro-magnetic force is called a *volt*.

Karl Ferdinand Von Græfe (1787-1840) was born at Warſaw, graduated at Leiſpic, and in 1811 was appointed profeſſor of ſurgery at Leiſpic. He ſuperintended Napoleon's military hoſpitals. He alſo revived the operation of rhinoplaſty. His contemporary and friend, *Karl Guſtavuſ Caruſ*, was juſtly renowned for his efforts in comparative anatomy. Another contemporary was *Civiale*, a French ſurgeon, who performed lithotrity for the firſt time in 1824, which operation has been greatly improved ſince *Civiale's* time, notably by Henry J. Bigelow.

Hermann von Helmholtz, born at Potsdam, 1821, wrote ſome valuable phyſiological works in connection with the eye and the nervous ſyſtem.

Jean Marie Gaſpard Itard (1775-1838), born in France, roſe to prominence as a phyſician and inſtructor of the deaf and dumb, without having received any previous training or education, medical or otherwiſe. His "Diseases of the Ear," in two volumes, published in 1821, is a ſtandard medical work, ſtill held in high eſteem.

François Magendie (1783-1855) was an eminent French phyſiologiſt and phyſician. He was the firſt to prove experimentally that the veins are organs of abſorption; he gave a more extended and accurate account of the proceſſ of vomiting than

had been previously given by any other physiologist; he pointed out that non-nitrogenous foods are non-nutritious, and that an animal cannot live solely on any one kind of food, however nitrogenous it might be; he investigated the physiological action and therapeutic uses of hydrocyanic acid and strychnia; he performed an important series of experiments on the cause of death when air is admitted into the large veins; he made numerous experiments to determine the functions of the various nerves and of different parts of the brain; and lastly, he shares with *Sir Charles Bell* the honor of having discovered the separate functions of the two roots of the spinal nerves. Magendie's chief physiological work, the "*Elémens de Physiologie*," was translated into English, and was for many years the best physiological work in any language, and is still used as a work of reference by the physiologists of to-day.

Cloquet, who was Magendie's contemporary and friend, was an eminent anatomist and a good surgeon. His work on "*Anatomy*" was issued in three volumes, and was highly esteemed. As a surgeon he invented many surgical instruments, which are still in use, and improved many surgical operations.

Dieffenbach, born in Prussia, 1782, became one of the greatest surgeons Prussia ever produced. He was especially noted as a surgeon in remedying deformities of the nose, and of the eyes, and of those deformities that were the cause of impediments of the speech. His work on the "*Treatment of Stammering*" may be still considered as an extremely valuable one. His great work on "*Operative Surgery*," published in 12 volumes, was translated into several languages.

Flourens, a celebrated French physiologist, who was born at Herault, 1794, graduated at Montpellier, 1813, at the age of 19 years. He became a voluminous writer on human anatomy and physiology and on comparative anatomy.

Jean Nicolas Gannal (1791-1852) was a French chemist noted for his discovery of the efficacy of injections of acetate and chloride of aluminum in preserving anatomical preparations. He accomplished embalming without mutilation of the body for the study of anatomy, by injecting into the carotid arteries solutions of aluminum salts. Many improvements in embalming have been made since Gannal's time, and at present formaldehyde has assumed a prominent place in the process of embalming of the dead human body.

The great triumvirate of the Paris Medical School during the middle part of the nineteenth century, *i.e.*, Andral, Chomel, and Louis, left the impress of their talent and skill on medicine. *Andral*, born at Paris, 1797, was a member of the Institute and Academy of Medicine, and flourished as professor of hygiene in 1828, and succeeded Broussais as professor of pathological anatomy in 1839. Andral's various published works will always remain as monuments of his fame. Among them are his "Clinique Médicale," "Digest of Pathological Anatomy," a "Treatise on Mediate Auscultation," a book on "Diseases of the Heart," three volumes on "Internal Pathology," and his "Researches on the Blood." Andral's lectures were full of learning, very carefully prepared, and methodically arranged. Andral is noted in medical history as a great pathologist.

Philip Ricord, born at Baltimore, 1800, and graduated at Paris in 1826, won a world-wide fame in the treatment of venereal diseases, a reputation which he owed to his combination of accurate physiological and pathological knowledge with great manual dexterity as a surgeon, and felicitous inventiveness and resource as a physician. His lectures and writings on syphilology, gonorrhea, and genito-urinary surgery have never been excelled for their fluency and grace of style, as well as for thorough knowledge of the subject. Ricord may be considered the greatest authority on venereal diseases the world ever produced. His works are too numerous to mention, except to say that they cover the whole field of genito-surgery and syphilology.

Johann Mueller, born at Coblenz, 1801, was an eminent physiologist. He wrote voluminously on the subject of physiology and is considered one of our leading authorities on the subject of histology.

The name of *Nicholas Pirogoff* stands out pre-eminently in the medical history of Russia. As a military surgeon he had no superior. He was to General Todleben, of Crimean fame, what Baron Larrey was to Napoleon Bonaparte. His classic work on military surgery was translated into many languages, and is still held in high esteem. Russia has honored the memory of Pirogoff in a most worthy manner by establishing and maintaining at St. Petersburg a museum known as the Pirogoff Museum. This museum is an ideal home for the medical profession, containing as it does a rich museum, in which are preserved the instruments used by Pirogoff in the Crimean campaign, a hall

for general meetings, and all that could be desired for the different specialties in medicine, with general and special libraries.

Justus von Liebig, born at Darmstadt, 1803, labored with great success in all the departments of chemistry, but particularly in organic chemistry, in which he made many discoveries, and did much to improve the method of analysis. In analytical chemistry he is especially noted, and also on the subject of fermentation, being for many years the greatest authority on the subject. Liebig's style was both terse and elegant, flowing naturally from a clear and strong intellect, and his capacity for severe and continued work was immense.

Joseph Hyrtl, born in Hungary, 1811, is considered an authority on comparative anatomy, and on the anatomy of the ear. He figured long and successfully at the University of Vienna as professor of topographic and comparative anatomy, and his work, "*Handbuch der topographischen Anatomie*," is highly regarded as a text-book on the subject by all the anatomists of the world.

HISTOLOGY.

Albrecht von Koelliker, born in Germany, 1817, rose to the position of professor of anatomy and physiology in the University of Wuerzburg. He is distinguished principally for his labors in the department of Microscopic Anatomy or Histology.

Johannes Mueller, a German by birth, published in 1830 an elaborate commentary on the minute structure of the glands, the first work in which the anatomy of the organs was examined and elucidated in a comprehensive manner and systematic way. *Ehrenberg*, 1830, explained the structure of numerous infusoria, and disclosed the peculiarities of many other structures, animal, vegetable, and mineral, which had previously eluded the most skilful researches. *Francis Kiernan*, in 1833, gave the first correct account of the minute anatomy of the liver. *Schleiden* and *Schwann*, in 1839, published most important generalizations on the cellular structures of vegetable and animal organisms. *Martin Barry* communicated new facts on the structure of the ovum and on the structure of cells generally. *John Goodsir* laid great emphasis on the office of the nucleus in the nutrition, growth, and reproduction of cells, and on the arrangement of the cells within an organism into departments and territories. *Virchow*, by his researches into connective tissues, has still further devel-

oped the idea of the cellular structure of the animal organism, and the importance of physiological and pathological processes. *Lionel Beale* attributed, both to the nucleus and to the substance of the cell immediately surrounding it, important functional properties. *Max Schultze* showed the identity in the nature between the sarcode substances of the lower animal organism and the contents of the cells in the higher animals, and applied to these substances the common term protoplasm, which had been previously introduced by Hugo Von Mohl to designate a similar material in the vegetable cell.

Auguste Nélaton (1807-1873), born at Paris, was a noted surgeon and teacher of surgery. Nélaton's soft rubber catheter, and Nélaton's probe, having an unpolished porcelain knob at its end, were introduced into surgery by Nélaton; the latter, though well known to every surgeon, is not used a great deal at the present time, thanks to the more modern methods. Nélaton also improved the operation of lithotomy in several ways and in genito-surgery he deserved the high esteem in which he was held by the medical profession.

Charles Edward Brown-Séquard, born in Mauritius, 1818, studied medicine at Paris, where he took his degree of M.D. in 1840. He afterward lectured and studied in America, especially in physiology. He soon returned to France, however, where he continued his medical work. Brown-Séquard demonstrated that the decussation of the sensory conductors is in the cord itself; and he has the reputation of having created the physiology of the sensory tract of the spinal cord. His experiments on the transfusion of the blood are also of interest. He also claimed to have discovered the "elixir of life," composed of an emulsion of the seminal glands of the sheep, which was used hypodermically. This somewhat fanciful experiment caused great excitement throughout the civilized world, but "the great expectations" were never realized.

Edouard S. Seguin (1812-1880), born in France, studied medicine and surgery under Itard, and became noted as an educator of idiotic children. He was very successful in his chosen field. A masterly treatise on the subject was published by Seguin, entitled "*Traitement Moral, Hygiène et Education des Idiots et des Autres Enfants Arriérés*," which has always been the standard text-book on the subject. Seguin also wrote other treatises on Idiocy, which were well received by his confreres. A work

on "Medical Thermometry" gained great favor among the medical fraternity; as did the physiological thermometer, which he invented, and which is in use among physicians of the present time.

BACTERIOLOGY.

Louis Pasteur, born at Dôle, in France, 1822, took his medical degree in 1847. He gained great fame in molecular chemistry, physical science, and bacteriology. In the province of fermentation and the germ theory he has achieved important results. His investigations into silk-worm disease, pebrine, and its cure, have proved of signal service. His discovery of bacteria as the cause of anthrax (splenic fever) in cattle was an epoch in the science of the disease. Similar results were obtained in regard to fowl cholera; and his experiments show success in preventing the various diseases caused by septic bacteria, by inoculating animals with a milder form of the disease by means of a weaker brood of bacteria, artificially cultured. In 1883 he studied cholera in Egypt with great zeal and energy. His name is probably best remembered as originating a cure by inoculation of the dread disease of hydrophobia. To Pasteur should be given the credit for furnishing the first reliable data from which the modern science of Bacteriology has been evolved and his discoveries marked an epoch in medicine.

FOUR GREAT SURGEONS.

Bernhard von Langenbeck, born in Germany, 1810, was a celebrated surgeon, who gained great fame through his skill and success in the operation for harelip, as well as in the replacement of noses, eyelids, and lips. He likewise gained a reputation by means of the operation of resection in which the diseased bone or injured joint is resected and the diseased part is removed. This operation Langenbeck executed with such ability and success, that many times a limb was saved, which previously was invariably sacrificed by amputation.

Theodore Billroth, probably the most celebrated of German surgeons, was born in the year 1829 and died in 1894. After his graduation in medicine, he became an assistant of Bernhard von Langenbeck; at the age of 31 years he was called to the chair of surgery at the University of Zurich; and from there he was appointed to the chair of surgery at the University of Vienna at the age of 37. Billroth represented the pathological ideal of the sur-

geon. He was one of the first to study the relationship of bacteria to wound-healing and to septic processes. He studied the reaction of the tissues to infectious agents. He labored assiduously over the minute and gross anatomy of the neoplasms, and later wrote a classical work on tumors of the breast. His practical surgical work on the stomach in the form of pylorotomy gave him a world-wide reputation. His book on "Surgical Pathology" was for many years a text-book even in American schools of medicine, and is still highly prized by surgeons. I remember that I enlarged about a hundred of the drawings in his text-book on surgical pathology, which were used by a lecturer on surgery in one of the medical schools of the West about the year 1880. However, Billroth's monumental work was the "Deutsche Chirurgie," a series of monographs by German writers.

The introduction of Billroth's "Surgical Pathology" is well worthy of your attention, as a historical sketch of surgery, and also as a good description of the obligations of the medical student who wishes to make a special study of surgery. Among other good things said by Billroth is the following. "The surgeon can only judge safely and correctly of the state of his patient when he is at the same time a physician."

Pean was a French surgeon and the contemporary of Billroth. He was, no doubt, the last of the great surgeons who put all their faith in manual skill, and had but little faith in anything else. As an operator in all branches of surgery, Pean probably has never been excelled at any time in the history of surgery. Whilst Billroth represented the pathological, Pean was the anatomical and mechanical ideal of surgery.

Johann Friedrich August Esmarch, born in Germany, 1823, is considered an authority on gunshot wounds, and has gained great renown as a military surgeon by means of his valuable improvements in the ambulances and the ambulance corps used by armies in battle, as well as in the barracks in which the soldiers live during the times of peace. Esmarch is the inventor of the bloodless method of operating on the extremities, which he combined with modern antiseptic and aseptic methods, as they are in use even to-day. Esmarch is the author of many valuable articles and books on surgical topics.

FOUR GREAT PHYSICIANS.

Hermann Nothnagel, born in Austria, 1841, is a celebrated physician of modern times. In 1865 he was appointed Leyden's

assistant at Koenigsberg, and in 1870 he published his celebrated work, "Handbuch der Arzneimittellehre." In 1894 he began the editing of his great "Special Pathology." Said Nothnagel in a lecture on the subject of the *all-around-training* of a practicing physician:—"There is no doubt that the tendency towards specialization in practical medicine is beneficial in the main, because it makes a more thorough study of a special subject possible; it may even be indispensable for the performance of certain technical operations; but this much may be expected from the practicing physician, that he should know enough of the so-called specialties at least to enable him to make a diagnosis and read the indications."

Robert Koch, born in Germany, 1843, graduated at the age of 23 years. Koch is the discoverer of the contagium of splenic fever, of the bacillus tuberculosis, etc. Koch and his supporters claim that each disease is caused by a specific micro-organism. For some six years after he graduated, Koch labored as an assistant in an obscure hospital, and in 1872 he finally succeeded in getting an appointment at Wollstein, where he continued to labor and study for seven years. It may be readily comprehended that Koch had ample time to prepare himself for his great success in the medical world, and that no success is possible without great labor and continued efforts to prepare oneself by arduous studies and never-ending toil for the duties of life to come later on.

The history and personality of *Kussmaul* must be of special interest to the practitioner of medicine, because it is said of Kussmaul that he brought order, law, and system into a mass of isolated facts. He received his degree in medicine from the institution at Heidelberg in 1855, and then he followed a course of clinical study at Vienna with those two great masters, Rokitansky and Skoda. In 1860 Kussmaul published his first important work—an exhaustive article on epilepsy, which stands even to-day as a classic. In 1863 he accepted the chair of clinical medicine at the institution at Freiburg, where he labored assiduously for seven years and made many important contributions to medical science.

Kussmaul guided the efforts of his pupils in such a way that he stimulated each to make the most of his powers; as Edinger says, he taught his pupils to think, to work, and to write, so that

the achievements of the German clinicians as investigators, thinkers, and writers are due in no small part to the influence of Kussmaul. Part of his work was the investigation into the diseases of the arteries and their classification into systemized groups, with clear instruction as to their essential characteristics, their symptoms, and the methods of their treatment. He also gave a clear description of diabetes. He was the first to introduce the use of the stomach pump; he first showed how bismuth should be given in gastro-intestinal diseases; he first practiced thoracentesis for the withdrawal of fluid from the serous cavities; and it is due to him that the German nation passed the stringent vaccination laws which are responsible for the present rarity of smallpox in Germany. Kussmaul died in 1902.

Rudolph Virchow, the father of modern cellular pathology, was born in 1821, in Pomerania, and received his medical degree at the University of Berlin in 1843. He lived to witness the greatest improvements in medicine of all time, the greater part of which he either made himself or at least helped to discover. In the year 1902 he died with the knowledge of having lived a useful life. "Whatever, outside of a cell, acts upon it," wrote Virchow, "works a mechanical or chemical change within it, which change is disorder or disease." This new knowledge completely changed conceptions of disease and made plain one of the foundations upon which it depended. It made possible the marvelous progress of the last few decades of the nineteenth century. Virchow is one of the masters of medicine, whose name must always be counted among the immortals.

In 1858 Virchow instituted the doctrine or theory known as "Modern Vitalism," which, in fact, was borrowed from natural scientific medicine and distinguished from the vitalism of the previous century in that it breaks up the vital force, which was supposed to be either distributed throughout the entire body or located in a few organs, into an indefinite number of associate forces working harmoniously, and assigns to them all the final elementary principle without microscopic seat. "Every animal principle has a sum of vital unities, each of which bears all the characteristics of life. The characteristics and unities of life cannot be found in any determinate point of a higher organism, *e. g.*, in the brain, but only in the definite, ever-recurring arrangement of each element present; hence it results that the composition of a large body amounts to a kind of social arrange-

ment, in which each one of the movements of the individual existence is dependent on the others, but in such a way that each cell has an activity of its own, and that each, although it receives the impulse to its own activity from other parts, still itself performs its own function." This is nothing but another way of expressing the cell-doctrine, to which many medical men are now committed, which means that all bodies are built up of cells and that each cell has a unity and a purpose of its own.

Time alone can decide as to the ultimate validity of Virchow's cellular pathology. An important feature in which the cellular pathology differs from other systems, and particularly from the old humoral pathology, is the doctrine that the blood itself is not the proper and original cause of dyscrasiæ and not the cause of continuous alterations of the tissues; that the dyscrasiæ arise because the blood is not an independent structure, but dependent upon the condition of the patient in consequence of its continuous conveyance of the noxious material from all parts of the body,—the blood is, therefore, merely the medium for the production of the dyscrasiæ. This theory has made several peculiar, new, and symptomatic or morphological forms of disease, such as leukæmia, leucocytosis, and what is popularly called pernicious anæmia. Virchow also cleared up the old and obscure ideas regarding pyæmia, and proved that an absorption of pus into the blood, which the name implies, is quite impossible; likewise, that pyæmia is inseparable from thrombosis.

Perhaps Virchow's greatest material monument is the Pathological Institute and Museum in Berlin, erected by the Government in accordance with his desires. It contained 23,000 specimens at the time of his death, and by far surpasses all similar collections in the world.

THE GERM THEORY.

The new theory of the cause of diseases, based on the results of the microscopical study of germs, the germ theory, stands in the closest possible relation with the doctrine of spontaneous generation, fermentation, miasm, and contagion. The germ theory of disease had its advocates two and a half centuries ago, which goes to show that the growth of any science is slow, and that a great number of workers take part in the gradual evolution of what perhaps a few get credit for by their skill in summing up the knowledge gathered by their predecessors. However, a good history of the germ theory can only be written after it has reached a sound basis.